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Assessment Highlights

Grade 6 Mathematics Achievement Testing Program

June 1991

Students
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Student Evaluation

Alberta
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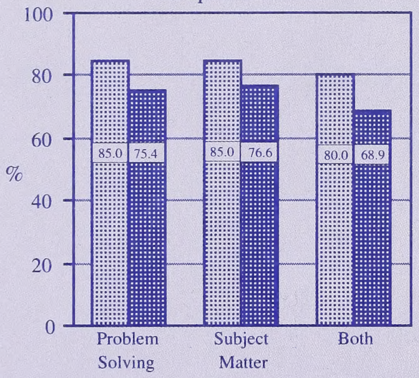
ASSESSMENT HIGHLIGHTS

GRADE 6 MATHEMATICS ACHIEVEMENT TESTING PROGRAM

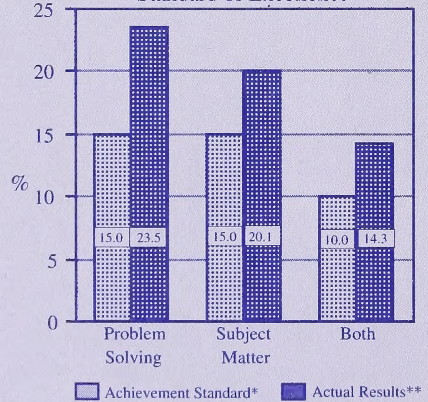
This report provides teachers, school administrators, and the public with a brief overview of the results for the June 1991 Grade 6 Mathematics Achievement Test. It complements the detailed school and jurisdiction reports that were mailed to schools and school jurisdiction offices in mid-September. The 1991 *Provincial Report, Achievement Testing Program* provides complete analyses of the provincial results for the Grade 6 Mathematics Achievement Test. This report will be available to educators and to the public in December 1991.

Percentage of Students Achieving:

Acceptable Standard



Standard of Excellence



*the percentage of students in the province expected to meet the acceptable standard and the standard of excellence

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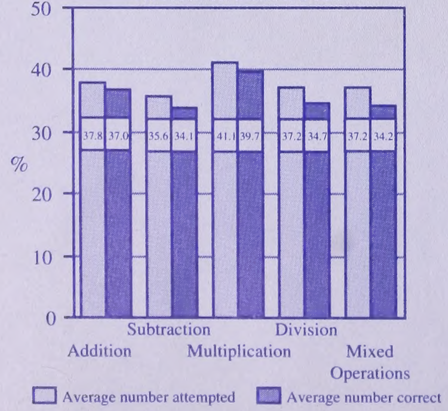
Results of Timed Tests



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How Well Did Students Do?

Students did not do as well as expected; however, top students did well on this test in both problem solving and subject matter. (See the first and second graphs.) Many students in the group performing below the standard of excellence had difficulty completing multistep problems and using mathematics to solve new or real-life problems.

Overall, student results on the timed tests of number facts indicate that by Grade 6 students can add, subtract, multiply, and divide quickly and accurately. (See the third graph.) The highest scores were achieved in multiplication, where 23% of the students scored 100%.

Observations (continued)

Acceptable Standard (continued)

46. $9\overline{)4321}$ equals

2.7 **A.** 318 R1
5.3 **B.** 329 R2
86.8***C.** 480 R1
4.9 **D.** 491 R2

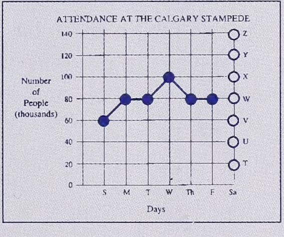
Question 46 required students to perform a routine procedure in division.

However, students could not do the following well enough:

- complete multistep problems
- transfer knowledge to new or real-life problem-solving situations
- understand which operations to use when solving problems.

Standard of Excellence – Sample Questions and Commentary

Use the graph below to answer question 24.



24. The graph shows the attendance at the Calgary Stampede for one week. Saturday's attendance was DOUBLE that of Sunday's. Which circle should be filled in to show Saturday's attendance?

3.8 **A.** Z
63.1 ***B.** Y
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Question 24 required students to read and interpret a graph, and to apply a multistep problem-solving strategy to a real-life situation.

11. 1 m + 4 cm + 2 mm equals

7.7 **A.** 10 402 mm
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Question 11 required students to manipulate mixed units.

Use the information below to answer question 53.

A cross-country skier goes 3 kilometres in 15 minutes.

53. At this rate, how long will it take the skier to go 15 km?

8.3 **A.** 150 min
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Question 53 required students to apply ratios to a multistep problem using a real-life situation.

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- demonstrate an understanding of equivalent fractions and place value in a problem-solving setting
- recognize flips, slides, and cylinder construction
- read and interpret graphs in problem-solving situations (see question 24)

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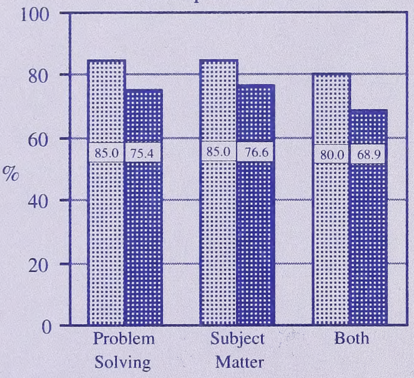

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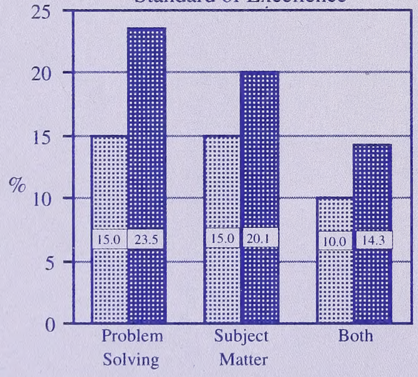

☐ Achievement Standard* ▨ Actual Results**

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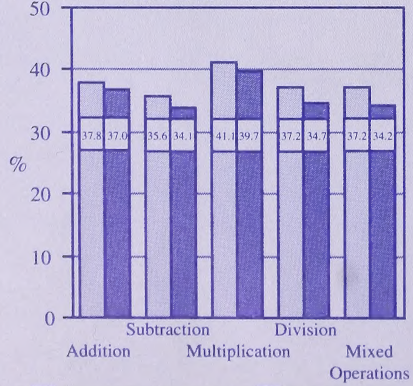
Results of Timed Tests



☐ Average number attempted ▨ Average number correct

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Has Achievement Changed Since 1983?

A special study of changes in achievement was conducted in 1991 as part of the provincial assessment. The results showed that achievement levels in 1991 were higher than in 1983 and in 1987. Details are reported in the 1991 *Provincial Report, Achievement Testing Program.*

The results for the 1983 number fact tests could not be compared to those results for the 1987 and the 1991 number fact tests. The 1983 number fact tests required students to answer on a separate answer sheet, whereas in 1987 and in 1991 students answered directly in the test booklets. As well, the number of questions, the time allotted, and the format of the 1983 tests differed from those of the 1987 and the 1991 tests. A comparison of the 1991 test results with the 1987 test results, however, indicates that student performance was relatively the same.

Test Blueprint

Each question on the test blueprint is classified in two ways: according to the curricular element and component being assessed, and according to the curricular element and cognitive level demanded by the question. The test blueprint shows the distribution of questions according to these classifications.

Grade 6 Mathematics
1991 Achievement Test Blueprint

	COMPONENTS			COGNITIVE LEVELS			
Curricular Elements	Problem Solving	Subject Matter	TOTAL	Knowledge	Compre- hension	Application and Problem Solving	TOTAL
Numeration	4, 53, 54, 55	1, 2, 3, 5, 6, 14, 15, 38, 39	13 [23.6%]	1, 2, 14, 38, 39	3, 5, 6, 15	4, 53, 54, 55	13 [23.6%]
Operations and Properties	20, 27, 36, 41, 47, 48, 50	29, 37, 40, 42, 43, 44, 45, 46, 49	16 [29.1%]	42	29, 36, 37, 40, 43, 44, 45, 46, 49	20, 27, 41, 47, 48, 50	16 [29.1%]
Measurement	16, 28, 35, 51, 52	7, 8, 11, 12, 13, 17	11 [20.0%]	7, 12, 13, 17	8, 11	16, 28, 35, 51, 52	11 [20.0%]
Geometry	32	9, 30, 31, 33, 34	6 [10.9%]	9, 30	31, 34	32, 33	6 [10.9%]
Graphing	21, 22, 23, 24, 25	26	6 [10.9%]	—	24, 26	21, 22, 23, 25	6 [10.9%]
Problem-Solving Strategies	10, 18, 19	—	3 [5.5%]	—	—	10, 18, 19	3 [5.5%]
TOTAL	25 [45.5%]	30 [55.5%]	55 [100.0%]	12 [21.8%]	19 [34.5%]	24 [43.6%]	55 [100.0%]

Test Results

The table at the left shows question-by-question results and the keyed answers. There is a parallel table in the school and jurisdiction reports that teachers can use to determine the areas of strength and weakness of their students relative to the province as a whole.

Grade 6 Mathematics
Results for Individual Multiple-Choice Questions

Item	Key	Diff.*	Item	Key	Diff.	Item	Key	Diff.	Item	Key	Diff.
1	B	79.9	15	D	41.0	29	B	48.9	43	D	74.2
2	C	73.8	16	D	69.6	30	B	79.6	44	A	88.8
3	B	69.4	17	B	72.4	31	A	61.0	45	D	61.2
4	D	52.3	18	B	78.0	32	C	65.7	46	C	86.8
5	A	63.8	19	D	52.0	33	A	62.6	47	B	69.0
6	C	60.9	20	D	87.8	34	A	90.2	48	C	79.0
7	A	71.6	21	B	88.8	35	C	50.1	49	D	84.6
8	A	78.3	22	D	49.3	36	A	63.4	50	C	60.5
9	B	90.6	23	A	76.2	37	A	60.8	51	B	60.2
10	A	78.5	24	B	63.1	38	C	70.3	52	B	44.7
11	C	47.1	25	D	67.4	39	B	60.5	53	C	61.6
12	C	82.6	26	C	73.9	40	C	75.7	54	A	58.5
13	B	74.5	27	D	77.5	41	B	69.5	55	C	71.2
14	A	43.2	28	C	50.7	42	D	73.7			

*Difficulty – percentage of students answering the question correctly

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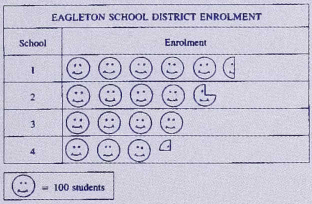
Observations

The following is a discussion of specific areas of strength and of difficulty for Grade 6 students. Sample questions have been provided to highlight the strengths and weaknesses of students achieving at the acceptable standard and at the standard of excellence. For each sample question, the correct answer is marked with an asterisk. The percentage of students choosing each alternative is also provided.

Acceptable Standard – Sample Questions and Commentary

Use the chart below to answer question 21.



21. What is the TOTAL enrolment of ALL the schools in the Eagleton School District?

4.5 **A.** 1725 students
88.8 ***B.** 1750 students
3.1 **C.** 1775 students
3.5 **D.** 1800 students

Question 21 required students to read a simple chart and then apply a one-step problem-solving strategy to a real-life situation. Most of the students answered correctly.

12. Which group of symbols represents standard units of measure from SMALLEST to LARGEST?

8.0 **A.** dm, cm, m
4.6 **B.** hm, km, mm
82.6***C.** cm, m, km
4.6 **D.** mm, km, m

Question 12 required students to recognize units of measure and to apply a routine procedure.

Generally, the Grade 6 teachers who analysed the standards built into the test felt that it reflected the nature of the Grade 6 Mathematics program. As well, these teachers felt that the provision of a section in which calculators were permitted was consistent with the NCTM Standards and with the philosophy and rationale of the role of technology in the *Elementary Mathematics Curriculum Guide,* 1982. The teachers also felt that because the program has been in operation for almost 10 years, the test items were predictable; in other words, there were no surprises in the content of the test.

General Statement on Student Performance

Overall, students were able to solve one-step problems, complete routine operations, and apply their knowledge to straightforward problem-solving questions. As well, students showed a knowledge of and an ability to use basic measurement skills.

Listed below are some areas where students performing at the acceptable standard and beyond showed a strong grasp of mathematics.

Grade 6 students could do the following:

- read simple charts and graphs (see question 21)
- recognize place value, parallel lines, congruency, problem-solving stages, co-ordinates, ordered pairs, and units of measure and equivalencies (see question 12)
- use routine procedures and operations in addition, subtraction, multiplication, division, and estimation (see question 46)
- apply simple one-step problem-solving strategies to real-life situations (see question 21).

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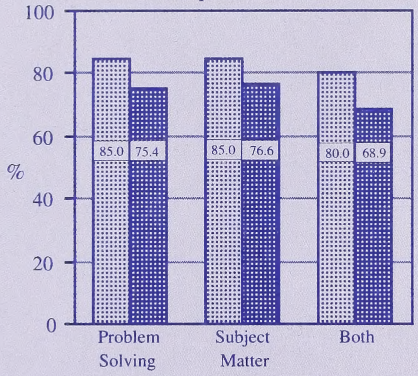

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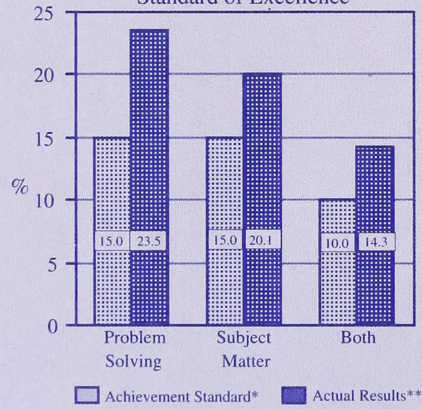

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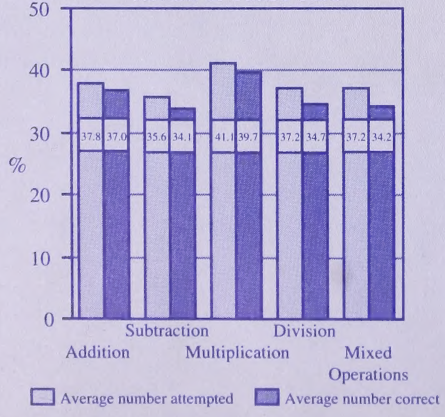

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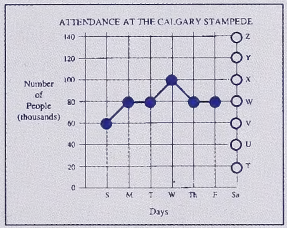

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Observations (continued)

Standard of Excellence (continued)

- manipulate mixed units, arrange integers, calculate averages, add decimals, convert fractions to decimals, apply ratios, and find area, volume, and perimeter (see questions 11 and 53)
- apply more complex multistep problem-solving strategies to real-life situations (see questions 24 and 53).

These students generally showed strengths in all areas that were assessed.

New Features of the Test

The introduction of a calculator and of the "cluster" questions on the June 1991 Grade 6 Mathematics Achievement Test was well accepted by most teachers. Teachers remarked that the test could have been done without using a calculator; therefore, students without calculators were not disadvantaged. Teachers noted that more than adequate time was provided for students to complete Booklet 1 and Booklet 2.

Issues

Some teachers and students felt that not enough time was provided to complete the five timed tests. These tests are designed to test only **mastery** of number facts. To do this, a time element is built in to the tests to discriminate between students who have mastered the number facts and those who have not.

Concluding Comments

Overall, the results showed that not enough students performed at the acceptable standard and that a larger number of students than expected performed at the standard of excellence. In other words, although some students are achieving very well, **most** students are not learning mathematical concepts and skills well enough. After carefully considering the questions that students found difficult, it seems that students lack **understanding** in some of the concepts and their applications to real-life situations. Students need more work and time with manipulatives at the concrete level to help them understand abstract concepts. Further, an increased emphasis on problem solving in a variety of contexts would help students connect their newly acquired mathematical concepts to real-life situations.

For further information contact Nola Aitken, Mathematics Test Development Specialist, at 427-0010.

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